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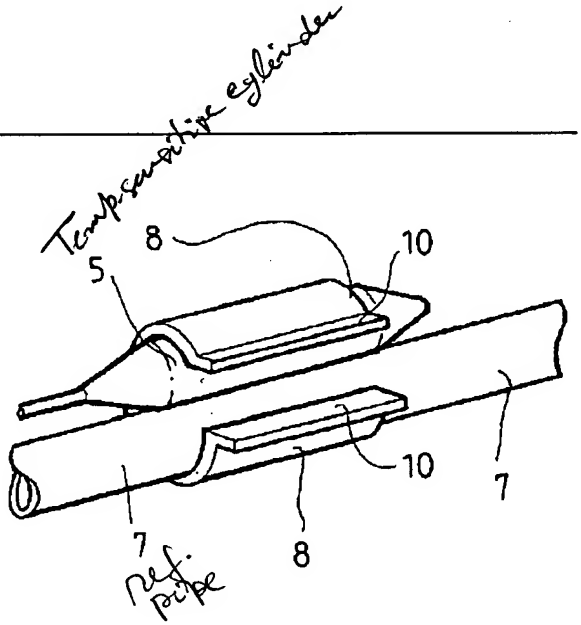
(54)【発明の名称】　温度式膨張弁の感温筒固定具

(57)【要約】

【目的】　温度式膨張弁の信頼性を高めるべく、膨張弁感温筒と冷媒配管とを、自動的に、且つ、確実に、強固に密着させた状態で固定可能であるとともに、容易に取り付けることが可能な作業性のよい形状記憶合金製の温度式膨張弁の感温筒固定具を提供すること。

【構成】　温度式膨張弁の感温筒固定具は、膨張弁感温筒５を蒸発器４出口側の冷媒配管７に取り付ける感温筒固定具であって、断面がＣ字状で端部が起立した起立部１０を有する弾性板材であり、その弾性板材には形状記憶合金が用いられ、その形状記憶合金製のホルダー８により膨張弁感温筒５と冷媒配管７とを密着した状態で一体に固定する。



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【特許請求の範囲】

【請求項１】　冷凍サイクルに使用される膨張弁の感温筒を蒸発器出口側の冷媒配管に取り付ける温度式膨張弁の感温筒固定具において、

端部が起立されて所定の距離だけ離間した一対の起立部を有する形状記憶合金製の弾性板材からなることを特徴とする感温筒固定具。

【請求項２】　冷凍サイクルに使用される膨張弁の感温筒を蒸発器出口側の冷媒配管に取り付ける温度式膨張弁の感温筒固定具において、

端部が起立されて所定の距離だけ離間した一対の起立部を有する形状記憶合金製の弾性板材からなるとともに、前記感温筒と冷媒配管とを相互に接触した状態で一体に固定するホルダーを有することを特徴とする感温筒固定具。

【請求項３】　請求項１又は請求項２に記載の感温筒固定具において、

前記感温筒固定具又は前記ホルダーの外周を覆う断熱材を有することを特徴とする感温筒固定具。

【請求項４】　請求項１又は請求項２に記載の感温筒固定具において、

前記感温筒固定具の弾性板材又は前記ホルダーの弾性板材は所定の形状記憶温度を有し、前記感温筒により検出される冷媒配管の温度が形状記憶温度に近づくに従って、前記起立部間の距離は小さくなることを特徴とする感温筒固定具。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、圧縮機、凝縮器、温度式自動膨張弁、蒸発器から成る冷凍サイクルにおいて、温度式自動膨張弁を制御する感温筒を蒸発器出口側の冷媒配管に取り付ける固定具に関するものであり、更に詳細には、その感温筒固定具が形状記憶合金により製作されているものである。

【０００２】

【従来の技術】一般に、冷凍機は、液化しやすい蒸気を冷媒に用いて、図１に示す冷凍サイクルを循環する間に液体から気体へと２相にわたって変化を繰り返すことにより冷凍力を発揮する。この冷凍サイクルは、図１に示すように、冷媒を圧縮する圧縮機１、圧縮された冷媒を液化する凝縮器２、凝縮器２から流出される冷媒の流量を制御する温度式自動膨張弁３、及び、温度式自動膨張弁３を介して流入された冷媒を低圧の気体に蒸発させる蒸発器４からなり、圧縮機１、凝縮器２、温度式自動膨張弁３、蒸発器４が冷媒配管７を介して相互に接続されることにより冷凍サイクルが構成される。

【０００３】前記した冷凍サイクルにおいて、凝縮器２から温度式自動膨張弁３を介して流入される冷媒量が多すぎる場合や冷媒量が少なすぎる場合には、蒸発器４における蒸発能力の過不足を生じてしまうことから、冷蔵庫、及び、冷凍庫等を適正な冷蔵能力をもって作動させることができなくなる虞がある。かかる問題を解消するために、従来より、図１に示すように、冷媒の蒸発気体が流出される蒸発器４の出口の近傍における冷媒配管７に接触して膨張弁感温筒５が取り付けられており、かかる膨張弁感温筒５を介して温度式自動膨張弁３の開閉を制御することにより、凝縮器２から蒸発器４に流入される冷媒の量を適正に調節し、冷蔵庫等を適正な冷蔵能力をもって作動させるようにしている。

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【０００４】ここに、膨張弁感温筒５は、蒸発器４から流出される冷媒気体における低圧の飽和圧力に対応する飽和温度から過熱度を検出し、その検出した過熱度に従って温度式自動膨張弁３の開閉を制御するものである。因みに、膨張弁感温筒５により検出された過熱度が低い場合には、蒸発器４により蒸発しきれない冷媒が流出するものと考えられることから、冷媒の流量を減少すべく温度式自動膨張弁３は閉じるように自動的に制御される。また、膨張弁感温筒５により検出された過熱度が高い場合には、蒸発器４の蒸発能力にはまだ余裕があるものと考えられることから、冷媒の流量を増加すべく温度式自動膨張弁３は開放するように自動的に制御される。

【０００５】前記した膨張弁感温筒５は、蒸発器４から流出される冷媒気体の過熱度を検出し、その検出した過熱度に基づいて温度式自動膨張弁３の開閉を制御するものであり、従って、冷媒気体の過熱度を正確に検出できない場合には温度式自動膨張弁３の開閉を適正に制御することができなくなることから、膨張弁感温筒５は冷媒配管７に密着させて取り付ける必要がある。それゆえに、かかる膨張弁感温筒５の取付構造について、従来より各種の取付構造、取付具が提案されている。

【０００６】このような膨張弁感温筒の固定具には、従来例として、例えば次に示すようなものがある。第１の従来例は、図７に示すように、冷媒配管１６に添えて膨張弁感温筒１５を針金２５で固定したものである。また、第２の従来例は、図８に示すように、同じく冷媒配管１６に添えて膨張弁感温筒１５を、断面がＣ字状のホルダー２８によって被覆し、そのホルダー２８端部の起立した部分をボルト２６とナット２７によって締め付けて固定したものである。また、第３の従来例は、図９に示すように、冷媒配管１６を直角に折り曲げ、その折り曲げた箇所に挿入孔２９を設けて膨張弁感温筒１５を挿入したものである。更に、第４の従来例は、図１０に示すように、冷媒配管１６と膨張弁感温筒１５とを並列に重ねて固定具３０で巻くようにし、水道用ホースバンド３１を使用して更に締め付けて固定するようにしたものである。

【０００７】

【発明が解決しようとする課題】第１の従来例では、針金２５を使用して結束してあり、針金２５の結束が手作業であるために作業性が悪い。更に、針金２５を結束す

る際に、作業者間で力の差が生じてバラツキが発生し、また、針金２５が切れて、再結束を必要とする虞もあり、作業性が悪く、振動に弱い。第２の従来例では、ホルダー２８とボルト２６、ナット２７の締めにより強力に締め付けることが可能であるが、ボルト２６とナット２７の芯合わせ、及び、ボルト２６とナット２７との締め付けに手間がかかり、作業性が悪い。第３の従来例では、冷媒配管１６を二重構造とするために構造自体が複雑となり、当該装置の作成工程の増加や、挿入孔２９の溶接部分からガス漏れが発生するおそれ等の不具合いが生じた。第４の従来例では、水道用ホースバンド３１では、締め付け力が弱く、十分な力で締め付けられない。また、振動に弱いといった不具合いがあった。上述したような締め付け不良が発生した場合、温度式自動膨張弁の過熱度が保たれなくなり、液バックによる液圧縮により、大きな故障等の不具合が発生する虞がある。

【０００８】そこで、本発明では、温度式膨張弁の信頼性を高めるべく、膨張弁感温筒を冷媒配管に、自動的に、且つ、確実に、強固に密着させた状態で固定可能であるとともに、容易に取り付けることが可能な作業性のよい形状記憶合金製の温度式膨張弁の感温筒固定具を提供することを目的とする。

【０００９】

【課題を解決するための手段】本発明の感温筒固定具は、冷凍サイクルに使用される膨張弁の感温筒を蒸発器出口側の冷媒配管に取り付ける膨張弁感温筒固定具において、端部が起立されて所定の距離だけ離間した一対の起立部を有する形状記憶合金製の弾性板材からなる構成とされる。また、感温筒固定具は、端部が起立されて所定の距離だけ離間した一対の起立部を有する形状記憶合金製の弾性板材からなるとともに、前記感温筒と冷媒配管とを相互に接触した状態で一体に固定するホルダーを有する構成であってもよい。更に、前記感温筒固定具又は前記ホルダーの外周を更に断熱材で覆ったものである。また、前記感温筒固定具の弾性板材又は前記ホルダーの弾性板材は所定の形状記憶温度を有し、前記感温筒により検出される冷媒配管の温度が形状記憶温度に近づくに従って、前記起立部間の距離は小さくなるものである。

【００１０】

【作用】上記の構成を有する本発明の感温筒固定具は、蒸発器出口側の冷媒配管に膨張弁感温筒を並べて配置する際に、形状記憶合金製の感温筒固定具又は形状記憶合金製のホルダーにより、前記冷媒配管と前記膨張弁感温筒とを、相互に接触させた状態で一体に固定する。このとき、感温筒固定具を構成する弾性板材又はホルダーを構成する弾性板材は、所定の形状記憶温度を有し、前記感温筒により検出される冷媒配管の温度が形状記憶温度に近づくに従って、端部で起立された前記起立部間の距離は小さくなる。これにより、冷媒配管と感温筒とは、

相互に密着した状態で自動的に強固に固定される。また、前記感温筒固定具又はホルダーの外周を更に断熱材で覆うようにする。

【００１１】

【実施例】次に、本発明の具体的な実施例について説明する。本発明の冷凍サイクルは上述したものと同様であり、以下の説明においても図１を参照する。図２は、冷媒配管に取り付けられた膨張弁感温筒を示す斜視図である。図２において、膨張弁感温筒５は、蒸発器４の出口側の冷媒配管７に接触した状態で重ねて配置されており、これらの各冷媒配管７と膨張弁感温筒５は、断面がＣ字状のホルダー８で被覆されている。また、このホルダー８は、冷媒配管７の長手方向に膨張弁感温筒５とほぼ同一の長さを有しており、断面がＣ字状の両端部にはそれぞれ起立部１０が形成されている。

【００１２】次に、ホルダー８について説明する。図３は、各温度におけるホルダー８の断面、及び、形状を示す図である。このホルダー８は、膨張弁感温筒５が挿嵌される円弧状部と、冷媒配管７が挿嵌される円弧状部とを一体に構成してあり、断面がほぼＣ字状に形成されている。膨張弁感温筒５が挿嵌される円弧状部は膨張弁感温筒５の直径よりも若干小さく設定され、また、同様に、冷媒配管７が挿嵌される円弧状部は冷媒配管７の直径よりも若干小さく設定されている。また、このホルダー８は、熱伝導性の良い材質であり、バネ性のあるＮｉ－Ｔｉ系の形状記憶合金が使用されている。

【００１３】このホルダー８に冷媒配管７と膨張弁感温筒５の両者を取り付ける際には、まず、ホルダー８内に開口部１１より膨張弁感温筒５を押し込み、定められた位置に配置する。次に、ホルダー８の弾性変形を利用して、そのホルダー８内に冷媒配管７を押し込むと、開口部１１が開き膨張弁感温筒５に並んで一体に固定される。このようにして、ホルダー８のバネ弾性力を介して膨張弁感温筒５と冷媒配管７とを密着した状態に固定する。

【００１４】次に、冷凍サイクルが作動して、膨張弁感温筒５と冷媒配管７との両者が低温になってゆく場合におけるホルダー８の形状の変化について説明する。まず、常温時において、ホルダー８は、膨張弁感温筒５と冷媒配管７の両者を軽く固定しており、ホルダー８の開口部１１の間隔は、図３の（Ａ）に示すようにＬ、である。しかし、温度が低下するにつれて、ホルダー８の形状記憶効果により、自動的に、ホルダー８に形状の変化が発生し始める。それゆえに、低温時（形状記憶設定温度）においては、ホルダー８によって、膨張弁感温筒５と冷媒配管７の両者は、自動的に、強く締め付けられるようになる。このときのホルダー８の開口部１１の間隔は、図３の（Ｂ）に示すように、Ｌ１である。また、低温時（形状記憶設定温度）において、ホルダー８に膨張弁感温筒５と冷媒配管７の両者が挿嵌されていない場

合、ホルダー８の開口部１１の間隔は、図３の（Ｃ）に示すように、Ｌ２である。

【００１５】上述した本発明のホルダー８の開口部１１の間隔と温度の関係を、更に図４に示している。この図４において、縦軸にホルダーの開口部１１の間隔を、横軸に温度を示している。この図４からわかるように、常温においては、ホルダー８の開口部１１の間隔はＬであり、大きい。しかし、温度が低下するにつれて、形状記憶効果により、ホルダー８の開口部１１の間隔は小さくなり、膨張弁感温筒５と冷媒配管７の両者を締め付け始める。更に、低温（形状記憶設定温度）においては、ホルダー８の開口部１１の間隔はＬ２となり、最も小さくなり、膨張弁感温筒５と冷媒配管７の両者を強く締め付ける。そして、冷凍サイクルの作動が停止し、温度が上昇して、常温に戻った場合には、ホルダー８の開口部１１の間隔はＬとなっている。

【００１６】前記した構成の膨張弁感温筒固定具の周囲を、図５に示すように、断熱材にて被覆すれば、一層正確に膨張弁感温筒５により冷媒配管７の温度を検出可能となる。ここに、図５は、上記冷媒配管に取り付けられた膨張弁感温筒固定具の周囲に更に断熱材を巻いた状態の断面を示す。断熱材９はガラスウール等の断熱材料からなり、かかる断熱材９は、前記のように、ホルダー８を介して膨張弁感温筒５と冷媒配管７とを相互に密着させた状態で固定した後、膨張弁感温筒５と冷媒配管７の双方の周囲を被覆する。このように膨張弁感温筒５と冷媒配管７とを断熱材９により被覆すれば、周囲の温度に左右されることなく膨張弁感温筒５を介して冷媒配管７の温度を正確に検出することができ、温度式自動膨張弁３の開閉制御を一層適正に行なうことができるものである。

【００１７】このような構成による温度式膨張弁感温筒固定具によれば、ホルダー８に形状記憶合金を使用してあることにより、膨張弁感温筒５と冷媒配管７とを、自動的に、確実に、且つ、強固に固定し密着させることができる。これにより、膨張弁感温筒５を介して冷媒配管７内を流れる冷媒気体の温度を正確に検出することができるとともに、その検出した温度に基づいて温度式自動膨張弁３の開閉制御を適正に行なうことができる。従って、冷媒が液体状態のままで圧縮機１に流入することを防止して、圧縮機１に故障等が発生することを確実に防止することができる。また、冷凍、冷蔵庫等の運搬時や作動時に振動が発生した場合においても、膨張弁感温筒５と冷媒配管７との密着を良好に保持することが可能であるために、振動による緩みの発生を防ぐことができる。更にまた、前記したように本実施例にかかる膨張弁感温筒固定具では、膨張弁感温筒５と冷媒配管７とを、ホルダー８のバネ弾性力を介して固定することができるので、かかる作業を行なう作業者の作業能力にバラツキがある場合においても、作業者間でバラツキを生じることなく膨張弁感温筒５と冷媒配管７とを常に一定の水準をもって密着固定することができるものである。

【００１８】以上、本発明の膨張弁感温筒固定具の一実施例について説明してきたが、本発明はこれに限定されるわけではなく、その趣旨を逸脱しない範囲で様々な変更が可能である。例えば、上記実施例では、ホルダー８の形状は断面がＣ字状であったが、図６の（Ａ）および（Ｂ）に示すように、断面がＳ字状やＸ字状の形状を有するホルダーであってもよい。また、上記実施例において、ホルダー８に使用した形状記憶合金は、Ｎｉ－Ｔｉ系であったが、Ｃｕ合金系等の熱伝導率の高い材質を使用すれば、効果は更に良好となり、信頼性、及び、反応スピードも向上する。

【００１９】

【発明の効果】以上説明したことから明らかなように、本発明の温度式膨張弁感温筒固定具によれば、ホルダーに形状記憶合金を用いていることにより、膨張弁感温筒と冷媒配管とを、自動的に、確実に、且つ、強固に密着させて固定することができ、もって、膨張弁感温筒を介して冷媒配管の温度を正確に検出し、温度式膨張弁の開閉制御を信頼性良く行なうことができるとともに、膨張弁感温筒と冷媒配管とを簡単な作業で容易に取り付けることができる温度式膨張弁感温筒固定具を提供することが可能である。

【図面の簡単な説明】

【図１】　冷凍サイクルの回路図である。

【図２】　本発明の温度式膨張弁の感温筒固定具を示す斜視図である。

【図３】　本発明で用いられる形状記憶合金製のホルダーの温度変化に対する形状変化を示す断面図である。

【図４】　本発明で用いられる形状記憶合金製のホルダーの温度変化に対する開口部の間隔の変化を示す図である。

【図５】　本発明の温度式膨張弁感温筒固定具の周囲を断熱材で被覆した状態を示す断面図である。

【図６】　本発明において使用可能な、他の形状をしたホルダーの例である。

【図７】　第１の従来例の膨張弁感温筒固定具を示す斜視図である。

【図８】　第２の従来例の膨張弁感温筒固定具を示す断面図である。

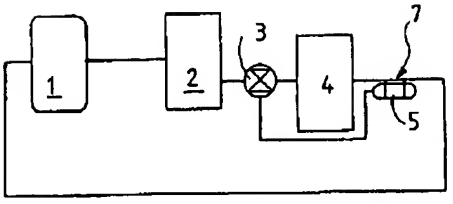
【図９】　第３の従来例の膨張弁感温筒固定具を示す側面図である。

【図１０】　第４の従来例の膨張弁感温筒固定具を示す断面図である。

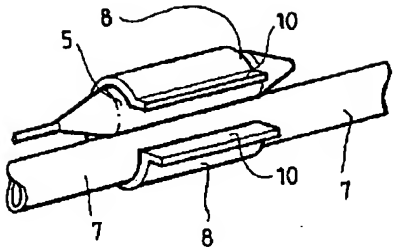
【符号の説明】

３・・温度式自動膨張弁、５・・膨張弁感温筒、７・・冷媒配管、８・・ホルダー、９・・断熱材、１０・・・起立部

【図1】



【図2】



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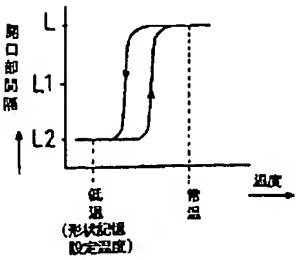

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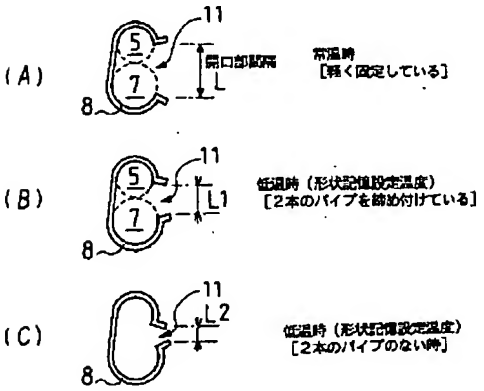

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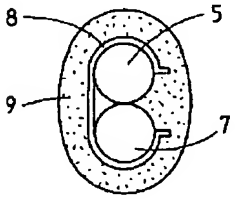

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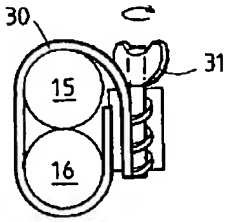

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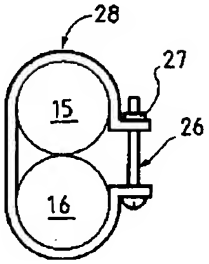

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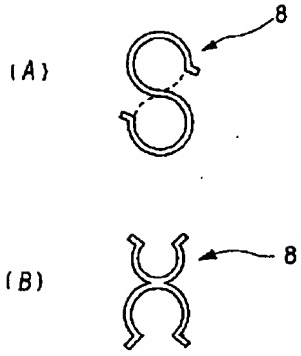

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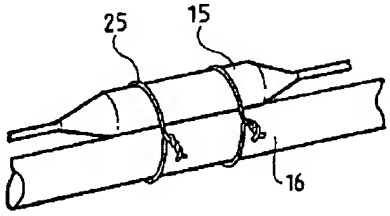

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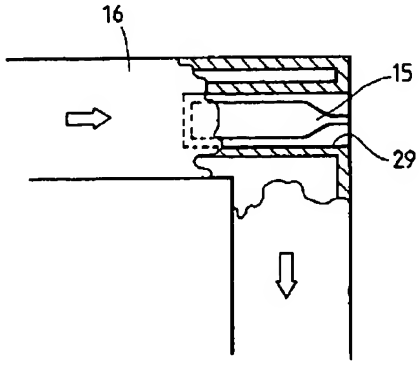

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DOCUMENT-IDENTIFIER: JP 08075327 A

TITLE: TEMPERATURE-SENSITIVE CYLINDER FIXTURE FOR TEMPERATURE
TYPE EXPANSION VALVE

PUBN-DATE: March 19, 1996

INVENTOR-INFORMATION:
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APPL-NO: JP06239562

APPL-DATE: September 6, 1994

INT-CL (IPC): F25B049/02

ABSTRACT:

PURPOSE: To provide a temperature-sensitive cylinder fixture, for a
temperature type expansion valve, which can hold an expansion valve
temperature-sensitive cylinder and a refrigerant pipe together automatically,
securely and closely to enhance the reliability of a temperature type expansion
valve and which is made of a shape memory alloy easy to attach and good in
operational efficiency.

CONSTITUTION: A temperature-sensitive cylinder fixture for a temperature
type expansion valve is for fixing a temperature-sensitive cylinder 5 of the
expansion valve to a refrigerant pipe 7 on the outlet side of an evaporator.
This fixture is of an elastic plate having C-shaped cross section and a raised

part 10 on each side, a shape memory alloy is used in the elastic plate and the
temperature- sensitive cylinder 5 of the expansion valve and the refrigerant
pipe 7 are closely held together into a unitary structure by a holder 8 made of
the shape memory alloy.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] In the refrigerating cycle to which this invention changes from a compressor, a condenser, a temperature type automatic expansion valve, and an evaporator, that temperature sensor barrel fastener is further manufactured by the detail with the shape memory alloy about the fastener which attaches in refrigerant piping of an evaporator outlet side the temperature sensor barrel which controls a temperature type automatic expansion valve.
[0002]
[Description of the Prior Art] Generally, a refrigerator uses for a refrigerant the steam which is easy to liquefy, and demonstrates the frozen force by repeating change from a liquid over circulating through the refrigerating cycle shown in drawing 1 to two phases to a gas. the temperature type automatic expansion valve 3 by which this refrigerating cycle controls the flow rate of the refrigerant which flows out of the compressor 1 which compresses a refrigerant, the condenser 2 which liquefies the compressed refrigerant, and a condenser 2 to be shown in drawing 1 -- and It consists of an evaporator 4 which evaporates the refrigerant which flowed through the temperature type automatic expansion valve 3 into a low-pressure gas, and a refrigerating cycle is constituted by connecting a compressor 1, a condenser 2, the temperature type automatic expansion valve 3, and an evaporator 4 mutually through the refrigerant piping 7.
[0003] In the above mentioned refrigerating cycle, when there are too many amounts of refrigerants which flow through the temperature type automatic expansion valve 3 from a condenser 2, or when there are too few amounts of refrigerants, since the excess and deficiency of the evaporative power force in an evaporator 4 are produced, there is a possibility that it may become impossible to operate a refrigerator, a freezer, etc. with proper refrigeration capacity. Conventionally, in order to solve this problem, as shown in drawing 1 , contact the refrigerant piping [/ near the outlet of the evaporator 4 with which the evaporation gas of a refrigerant flows out] 7, and the expansion valve temperature sensor barrel 5 is attached. He adjusts the amount of the refrigerant which flows into an evaporator 4 proper, and is trying to operate a refrigerator etc. with proper refrigeration capacity from a condenser 2 by controlling closing motion of the temperature type automatic expansion valve 3 through this expansion valve temperature sensor barrel 5.
[0004] Here, the expansion valve temperature sensor barrel 5 detects a degree of superheat here from the saturation temperature corresponding to the low-pressure saturation pressure in the refrigerant gas which flows out of an evaporator 4, and controls closing motion of the temperature type automatic expansion valve 3 according to the detected degree of superheat. Since it is thought that the refrigerant which cannot evaporate with an evaporator 4 flows out when the degree of superheat detected by the expansion valve temperature sensor barrel 5 is incidentally low, the temperature type automatic expansion valve 3 is controlled automatically to close that the flow rate of a refrigerant should be decreased. Moreover, since it is thought that there are still allowances in the evaporative power force of an evaporator 4 when the degree of superheat detected by the expansion valve temperature sensor barrel 5 is high, the

temperature type automatic expansion valve 3 is controlled automatically to open that the flow rate of a refrigerant should be increased.

[0005] Since the degree of superheat of the refrigerant gas which flows out of an evaporator 4 is detected, and closing motion of the temperature type automatic expansion valve 3 is not controlled based on the detected degree of superheat, and it becomes impossible to control closing motion of the temperature type automatic expansion valve 3 proper when the degree of superheat of a refrigerant gas is [therefore] correctly undetectable, it is necessary to stick the above mentioned expansion valve temperature sensor barrel 5 for the refrigerant piping 7, and it needs to attach the expansion valve temperature sensor barrel 5. So, various kinds of attachment structures and a fixture are proposed from before about the attachment structure of this expansion valve temperature sensor barrel 5.

[0006] There is a thing as shown below in the fastener of such an expansion valve temperature sensor barrel as a conventional example. As shown in drawing 7 , the 1st conventional example is attached to the refrigerant piping 16, and fixes the expansion valve temperature sensor barrel 15 with a wire 25. Moreover, as shown in drawing 8 , similarly the 2nd conventional example is attached to the refrigerant piping 16, a cross section covers the expansion valve temperature sensor barrel 15 with the C character-like electrode holder 28, and binds tight the part into which the electrode-holder 28 edge stood up with a bolt 26 and a nut 27, and is fixed. Moreover, as shown in drawing 9 , the 3rd conventional example bends the refrigerant piping 16 at a right angle, forms the insertion hole 29 in the bent part, and inserts the expansion valve temperature sensor barrel 15. Furthermore, as shown in drawing 10 , the 4th conventional example winds the refrigerant piping 16 and the expansion valve temperature sensor barrel 15 around juxtaposition with a fastener 30 in piles, binds them tight further using the hose band 31 for waterworks, and is fixed.

[0007]

[Problem(s) to be Solved by the Invention] In the 1st conventional example, it has banded together using the wire 25, and since union of a wire 25 is handicraft, workability is bad. Furthermore, in case a wire 25 is banded together, the difference of the force arises among operators, and variation occurs, and a wire 25 is turned off, there is also a possibility of needing re-union, and workability is bad and weak to vibration. Although it is possible to bind tight powerfully by the bundle of an electrode holder 28, a bolt 26, and a nut 27 in the 2nd conventional example, the alignment of a bolt 26 and a nut 27 and bolting by the bolt 26 and the nut 27 take time and effort, and workability is bad. In the 3rd conventional example, in order to make refrigerant piping 16 into dual structure, the structure itself became complicated, and faults, such as an increment in the creation process of the equipment concerned and a possibility that gas leakage may occur from the weld of the insertion hole 29, arose. In the 4th conventional example, in the hose band 31 for waterworks, the bolting force is weak and is not bound tight by sufficient force. Moreover, the fault of being weak was in vibration. When poor bolting which was mentioned above occurs, the degree of superheat of a temperature type automatic expansion valve is no longer maintained, and there is a possibility that faults, such as big failure, may occur, by liquid compression by the liquid back.

[0008] Then, while an expansion valve temperature sensor barrel is fixable to refrigerant piping with the condition of having made it sticking firmly certainly automatically in order to raise the dependability of a temperature type expansion valve in this invention, it aims at offering the good temperature sensor barrel fastener of the temperature type expansion valve made from a shape memory alloy of the workability which can be attached easily.

[0009]

[Means for Solving the Problem] The temperature sensor barrel fastener of this invention is considered as the configuration which consists of elastic plate material made from a shape memory alloy which has the standing-up section of the pair which the edge stood up and estranged only a predetermined distance in the expansion valve temperature sensor barrel fastener which attaches in refrigerant piping of an evaporator outlet side the temperature sensor barrel of the expansion valve used for a refrigerating cycle. Moreover, a temperature sensor barrel fastener may be the configuration of having the electrode holder which fixes said temperature sensor barrel and refrigerant piping to one in the condition of having

contacted mutually while consisting of elastic plate material made from a shape memory alloy which has the standing-up section of the pair which the edge stood up and estranged only a predetermined distance. Furthermore, the periphery of said temperature sensor barrel fastener or said electrode holder is further covered with a heat insulator. Moreover, the elastic plate material of said temperature sensor barrel fastener or the elastic plate material of said electrode holder has predetermined shape memory temperature, and the distance between said standing-up sections becomes small as the temperature of refrigerant piping detected by said temperature sensor barrel approaches shape memory temperature.
[0010]
[Function] In case the temperature sensor barrel fastener of this invention which has the above-mentioned configuration arranges an expansion valve temperature sensor barrel side by side for refrigerant piping of an evaporator outlet side, it fixes said refrigerant piping and said expansion valve temperature sensor barrel to one in the condition of having made it contacting mutually, with the temperature sensor barrel fastener made from a shape memory alloy, or the electrode holder made from a shape memory alloy. The elastic plate material which constitutes the elastic plate material or electrode holder which constitutes a temperature sensor barrel fastener at this time has predetermined shape memory temperature, and the distance between said standing-up sections which stood up at the end becomes small as the temperature of refrigerant piping detected by said temperature sensor barrel approaches shape memory temperature. Thereby, refrigerant piping and a temperature sensor barrel are automatically fixed firmly in the condition of having stuck mutually. Moreover, the periphery of said temperature sensor barrel fastener or an electrode holder is further covered with a heat insulator.
[0011]
[Example] Next, the concrete example of this invention is explained. The refrigerating cycle of this invention is the same as that of what was mentioned above, and drawing 1 is referred to also in the following explanation. Drawing 2 is the perspective view showing the expansion valve temperature sensor barrel attached in refrigerant piping. In drawing 2 , the expansion valve temperature sensor barrel 5 is arranged in piles, where the refrigerant piping 7 of the outlet side of an evaporator 4 is contacted, and as for these each refrigerant piping 7 and expansion valve temperature sensor barrels 5, the cross section is covered with the C character-like electrode holder 8. Moreover, this electrode holder 8 has the almost same die length as the expansion valve temperature sensor barrel 5 in the longitudinal direction of the refrigerant piping 7, and the standing-up section 10 is formed in C character-like both ends for the cross section, respectively.
[0012] Next, an electrode holder 8 is explained. Drawing 3 is the cross section of the electrode holder 8 in each temperature, and drawing showing a configuration. This electrode holder 8 constitutes in one the circular section in which the expansion valve temperature sensor barrel 5 is fitted, and the circular section in which the refrigerant piping 7 is fitted, and the cross section is formed in the shape of about C characters. The circular section in which the expansion valve temperature sensor barrel 5 is fitted is small set up a little rather than the diameter of the expansion valve temperature sensor barrel 5, and the circular section in which the refrigerant piping 7 is fitted is similarly set up small a little rather than the diameter of the refrigerant piping 7. Moreover, this electrode holder 8 is the thermally conductive good quality of the material, and the shape memory alloy of a nickel-Ti system with spring nature is used.
[0013] In case both refrigerant piping 7 and expansion valve temperature sensor barrel 5 are attached in this electrode holder 8, first, in an electrode holder 8, from opening 11, the expansion valve temperature sensor barrel 5 is pushed in, and it arranges in the defined location. Next, when the refrigerant piping 7 is pushed in in the electrode holder 8 using the elastic deformation of an electrode holder 8, opening 11 opens and it is fixed to one together with the expansion valve temperature sensor barrel 5. Thus, it fixes to the condition of having stuck the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 through the spring elastic force of an electrode holder 8.
[0014] Next, a refrigerating cycle operates and change of the configuration of the electrode holder 8 in case both expansion valve temperature sensor barrel 5 and refrigerant piping 7 become low temperature is explained. first, the electrode holder 8 is fixing lightly both expansion valve temperature sensor barrel 5 and refrigerant piping 7 at the time of ordinary temperature, and spacing of the opening 11 of an

electrode holder 8 is shown in (A) of drawing 3 -- as -- L -- it comes out. However, change of a configuration begins to occur in an electrode holder 8 automatically according to the shape memory effect of an electrode holder 8 as temperature falls. So, both expansion valve temperature sensor barrel 5 and refrigerant piping 7 come to be automatically bound tight strongly with an electrode holder 8 at the time of low temperature (shape memory laying temperature). Spacing of the opening 11 of the electrode holder 8 at this time is L1 as shown in (B) of drawing 3 . Moreover, when both expansion valve temperature sensor barrel 5 and refrigerant piping 7 are not fitted in the electrode holder 8 at the time of low temperature (shape memory laying temperature), spacing of the opening 11 of an electrode holder 8 is L2 as shown in (C) of drawing 3 .

[0015] Spacing of the opening 11 of the electrode holder 8 of this invention and the relation of temperature which were mentioned above are further shown in drawing 4 . In this drawing 4 , spacing of the opening 11 of an electrode holder is shown on an axis of ordinate, and temperature is shown on the axis of abscissa. In ordinary temperature, spacing of the opening 11 of an electrode holder 8 is L, and large so that this drawing 4 may show. However, according to a shape memory effect, spacing of the opening 11 of an electrode holder 8 becomes small, and begins to bind both expansion valve temperature sensor barrel 5 and refrigerant piping 7 tight as temperature falls. Furthermore, in low temperature (shape memory laying temperature), spacing of the opening 11 of an electrode holder 8 is set to L2, becomes the smallest, and binds strongly both expansion valve temperature sensor barrel 5 and refrigerant piping 7 tight. And when actuation of a refrigerating cycle stops, temperature rises and it returns to ordinary temperature, spacing of the opening 11 of an electrode holder 8 is L.

[0016] If the perimeter of the expansion valve temperature sensor barrel fastener of a configuration of having described above is covered with a heat insulator as shown in drawing 5 , it will become detectable [the temperature of the refrigerant piping 7] with the expansion valve temperature sensor barrel 5 much more correctly. Drawing 5 shows the cross section in the condition of having wound the heat insulator around the perimeter of the expansion valve temperature sensor barrel fastener attached at the above-mentioned refrigerant piping further here. A heat insulator 9 consists of insulators, such as glass wool, and this heat insulator 9 covers the perimeter of the both sides of the expansion valve temperature sensor barrel 5 and the refrigerant piping 7, after fixing as mentioned above, where the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 are mutually stuck through an electrode holder 8. Thus, if the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 are covered with a heat insulator 9, the temperature of the refrigerant piping 7 can be correctly detected through the expansion valve temperature sensor barrel 5, without being influenced by surrounding temperature, and closing motion control of the temperature type automatic expansion valve 3 can be performed much more proper.

[0017] According to the temperature type expansion valve temperature sensor barrel fastener by such configuration, by having used the shape memory alloy for the electrode holder 8, it can fix automatically, certainly, and firmly and the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 can be stuck. While the temperature of the refrigerant gas which flows the inside of the refrigerant piping 7 through the expansion valve temperature sensor barrel 5 is correctly detectable by this, based on the detected temperature, closing motion control of the temperature type automatic expansion valve 3 can be performed proper. Therefore, it can prevent flowing into a compressor 1, while the refrigerant has been in a liquid condition, and can prevent certainly that failure etc. occurs in a compressor 1. Moreover, since it is possible to hold adhesion with the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 good when vibration occurs at the time of conveyance of refrigeration, a refrigerator, etc., and actuation, generating of the slack by vibration can be prevented. Furthermore, adhesion immobilization of the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 can always be carried out with a fixed level, without producing variation among operators in the expansion valve temperature sensor barrel fastener concerning this example again, when variation is in the work performance of the operator who does this activity, since the expansion valve temperature sensor barrel 5 and the refrigerant piping 7 are fixable through the spring elastic force of an electrode holder 8 as described above.

[0018] As mentioned above, although one example of the expansion valve temperature sensor barrel fastener of this invention has been explained, various modification is possible for this invention in the range which is not necessarily limited to this and does not deviate from the meaning. For example, in the above-mentioned example, although the cross section was a C character-like, the configuration of an electrode holder 8 may be an electrode holder with which a cross section has the configuration of the shape of the shape of S character, or an X character, as shown in (A) of drawing 6 , and (B). Moreover, in the above-mentioned example, although the shape memory alloy used for the electrode holder 8 was a nickel-Ti system, if the quality of the material with high thermal conductivity, such as Cu alloy system, is used, effectiveness will become still better and reaction speed's [dependability and] will improve.
[0019]
[Effect of the Invention] According to the temperature type expansion valve temperature sensor barrel fastener of this invention, so that clearly from having explained above By using the shape memory alloy for the electrode holder, an expansion valve temperature sensor barrel and refrigerant piping While it can be made to be able to stick automatically, certainly, and firmly, being able to fix, being able to have, being able to detect the temperature of refrigerant piping correctly through an expansion valve temperature sensor barrel and being able to perform closing motion control of a temperature type expansion valve with sufficient dependability It is possible to offer the temperature type expansion valve temperature sensor barrel fastener which can attach easily an expansion valve temperature sensor barrel and refrigerant piping by the easy activity.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The temperature sensor barrel fastener characterized by consisting of elastic plate material made from a shape memory alloy which has the standing-up section of the pair which the edge stood up and estranged only a predetermined distance in the temperature sensor barrel fastener of the temperature type expansion valve which attaches in refrigerant piping of an evaporator outlet side the temperature sensor barrel of the expansion valve used for a refrigerating cycle.
[Claim 2] The temperature sensor barrel fastener characterized by having the electrode holder which fixes said temperature sensor barrel and refrigerant piping to one in the condition of having contacted mutually while consisting of elastic plate material made from a shape memory alloy which has the standing-up section of the pair which the edge stood up and estranged only a predetermined distance in the temperature sensor barrel fastener of the temperature type expansion valve which attaches in refrigerant piping of an evaporator outlet side the temperature sensor barrel of the expansion valve used for a refrigerating cycle.
[Claim 3] The temperature sensor barrel fastener characterized by having a wrap heat insulator for the periphery of said temperature sensor barrel fastener or said electrode holder in a temperature sensor barrel fastener according to claim 1 or 2.
[Claim 4] It is the temperature sensor barrel fastener characterized by the distance between said standing-up sections becoming small as the temperature of refrigerant piping which the elastic plate material of said temperature sensor barrel fastener or the elastic plate material of said electrode holder has predetermined shape memory temperature, and is detected by said temperature sensor barrel in a temperature sensor barrel fastener according to claim 1 or 2 approaches shape memory temperature.

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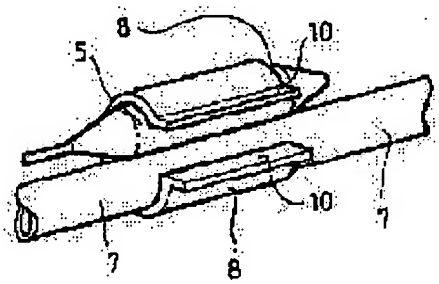
(54) TEMPERATURE-SENSITIVE CYLINDER FIXTURE FOR TEMPERATURE TYPE EXPANSION VALVE

(57)Abstract:

PURPOSE: To provide a temperature-sensitive cylinder fixture, for a temperature type expansion valve, which can hold an expansion valve temperature-sensitive cylinder and a refrigerant pipe together automatically, securely and closely to enhance the reliability of a temperature type expansion valve and which is made of a shape memory alloy easy to attach and good in operational efficiency.

CONSTITUTION: A temperature-sensitive cylinder fixture for a temperature type expansion valve is for fixing a temperature-sensitive cylinder 5 of the expansion valve to a refrigerant pipe 7 on the outlet side of an evaporator. This fixture is of an elastic plate having C-shaped cross section and a raised part 10 on each side, a shape memory alloy is used in the elastic plate and the temperature- sensitive cylinder 5 of the expansion valve and the refrigerant pipe 7 are closely held together into a unitary structure by a holder 8 made of the shape memory alloy.



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